TEST PAPER OF JEE(MAIN) EXAMINATION – 2019

(Held On SATURDAY 12th JANUARY., 2019) TIME : 02 : 30 PM To 05 : 30 PM

MATHEMATICS

1. Let Z be the set of integers. If $A=\left\{x\in Z:2^{(x+2)\left(x^2-5x+6\right)}=1\right\}$ and $B=\{x\in Z:-3<2x-1<9\}$, then the number of subsets of the set A × B, is :

(1) 2^{18} (2) 2^{10} (3) 2^{15} (4) 2^{12}

Ans (3)

Sol. A = {x ∈ z : $2^{(x+2)(x^2-5x+6)}$ = 1}

$2^{(x+2)(x^2-5x+6)} = 2^0 \Rightarrow x = -2, 2, 3$

A = {–2, 2, 3}

B = {x ∈ Z : –3 < 2x – 1 < 9}

B = {0, 1, 2, 3, 4}

A × B has is 15 elements so number of subsets of A × B is 2^{15}.

2. If $\sin^4\alpha+4\cos^4\beta+2=4\sqrt{2}\sin\alpha\cos\beta$; $\alpha, \beta\in[0,\pi]$, then cos(α + β) – cos(α – β) is equal to :

(1) 0 (2) $-\sqrt{2}$ (3) –1 (4) $\sqrt{2}$

Ans (2)

Sol. A.M. ≥ G.M.

$$\frac{\sin^4\alpha+4\cos^4\beta+1+1}{4}\ge(\sin^4\alpha.4\cos^4\beta.1.1)^{\frac{1}{4}}$$

$\sin^4\alpha + 4\cos^2\beta + 2 \ge 4\sqrt{2}\sin\alpha\cos\beta$

given that $\sin^4\alpha + 4\cos^4\beta + 2 = 4\sqrt{2}\sin\alpha\cos\beta$

$\Rightarrow$ A.M. = G.M. $\Rightarrow \sin^4\alpha = 1 = 4\cos^4\beta$

$\sin\alpha = 1, \cos\beta = \pm\frac{1}{\sqrt{2}}$

$\Rightarrow \sin\beta = \frac{1}{\sqrt{2}}$ as $\beta\in[0,\pi]$

$\cos(\alpha+\beta) - \cos(\alpha-\beta) = -2\sin\alpha\sin\beta$

$= -\sqrt{2}$

3. If an angle between the line, $\frac{x+1}{2}=\frac{y-2}{1}=\frac{z-3}{-2}$ and the plane, x – 2y – kz = 3 is $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$, then a value of k is:

(1) $-\frac{5}{3}$ (2) $\sqrt{\frac{3}{5}}$ (3) $\sqrt{\frac{5}{3}}$ (4) $-\frac{3}{5}$

Ans (3)

Sol. DR's of line are 2, 1, –2

normal vector of plane is $\hat{i}-2\hat{j}-k\hat{k}$

$$\sin\alpha = \frac{(2\hat{i}+\hat{j}-2\hat{k}).(\hat{i}-2\hat{j}-k\hat{k})}{3\sqrt{1+4+k^2}}$$

$$\sin\alpha = \frac{2k}{3\sqrt{k^2+5}} \qquad ....(1)$$

$$\cos\alpha = \frac{2\sqrt{2}}{3} \qquad ....(2)$$

$(1)^2 + (2)^2 = 1 \Rightarrow k^2 = \frac{5}{3}$

4. If a straight line passing thourgh the point P(–3, 4) is such that its intercepted portion between the coordinate axes is bisected at P, then its equation is :

(1) x – y + 7 = 0

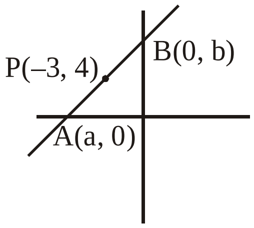
(2) 3x – 4y + 25 = 0

(3) 4x + 3y = 0

(4) 4x – 3y + 24 = 0

Ans (4)

Sol.



Let the line be $\frac{x}{a}+\frac{y}{b} = 1$

$(-3, 4) = \left(\frac{a}{2}, \frac{b}{2}\right)$

$a = -6$, $b = 8$

equation of line is $4x - 3y + 24 = 0$

5. The integral $\int \frac{3x^{13}+2x^{11}}{\left(2x^4+3x^2+1\right)^4}dx$ is equal to :

(where C is a constant of integration)

(1) $\frac{x^4}{\left(2x^4+3x^2+1\right)^3}+C$

(2) $\frac{x^{12}}{6\left(2x^4+3x^2+1\right)^3}+C$

(3) $\frac{x^4}{6\left(2x^4+3x^2+1\right)^3}+C$

(4) $\frac{x^{12}}{\left(2x^4+3x^2+1\right)^3}+C$

Ans (2)

Sol. $\int \frac{3x^{13}+2x^{11}}{(2x^4+3x^2+1)^4}\,dx$

$$\int \frac{\left(\frac{3}{x^3}+\frac{2}{x^5}\right)dx}{\left(2+\frac{3}{x^2}+\frac{1}{x^4}\right)^4}$$

Let $\left(2+\frac{3}{x^2}+\frac{1}{x^4}\right) = t$

$$-\frac{1}{2}\int \frac{dt}{t^4} = \frac{1}{6t^3}+C \Rightarrow \frac{x^{12}}{6(2x^4+3x^2+1)^3}+C$$

6. There are m men and two women participating in a chess tournament. Each participant plays two games with every other participant. If the number of games played by the men between themselves exceeds the number of games played between the men and the women by 84, then the value of m is :

(1) 9 (2) 11 (3) 12 (4) 7

Ans (3)

Sol. Let m-men, 2-women

${}^{m}C_2 \times 2 = {}^{m}C_1\, {}^{2}C_1 \,.\, 2 + 84$

$m^2 - 5m - 84 = 0 \Rightarrow (m - 12)(m + 7) = 0$

$m = 12$

7. If the function f given by $f(x) = x^3 - 3(a-2)x^2 + 3ax + 7$, for some $a \in R$ is increasing in (0, 1] and decreasing in [1, 5), then a root of the equation, $\frac{f(x)-14}{(x-1)^2} = 0 (x \neq 1)$ is :

(1) 6 (2) 5 (3) 7 (4) –7

Ans (3)

Sol. $f'(x) = 3x^2 - 6(a-2)x + 3a$

$f'(x) \geq 0 \;\forall\; x \in (0, 1]$

$f'(x) \leq 0 \;\forall\; x \in [1, 5)$

$\Rightarrow f'(x) = 0$ at $x = 1 \Rightarrow a = 5$

$f(x) - 14 = (x-1)^2 (x-7)$

$\frac{f(x)-14}{(x-1)^2} = x - 7$

8. Let f be a differentiable function such that $f(1) = 2$ and $f'(x) = f(x)$ for all $x \in R$. If $h(x) = f(f(x))$, then $h'(1)$ is equal to :

(1) 4e (2) $4e^2$ (3) 2e (4) $2e^2$

Ans (1)

Sol. $\frac{f'(x)}{f(x)} = 1 \;\forall\; x \in R$

Intergrate & use $f(1) = 2$

$f(x) = 2e^{x-1} \Rightarrow f'(x) = 2e^{x-1}$

$h(x) = f(f(x)) \Rightarrow h'(x) = f'(f(x))\, f'(x)$

$h'(1) = f'(f(1))\, f'(1)$

$= f'(2)\, f'(1)$

$= 2e \cdot 2 = 4e$

9. The tangent to the curve $y = x^2 - 5x + 5$, parallel to the line $2y = 4x + 1$, also passes through the point.

(1) $\left(\frac{1}{4}, \frac{7}{2}\right)$ (2) $\left(\frac{7}{2}, \frac{1}{4}\right)$

(3) $\left(-\frac{1}{8}, 7\right)$ (4) $\left(\frac{1}{8}, -7\right)$

Ans (4)

Sol. $y = x^2 - 5x + 5$

$\frac{dy}{dx} = 2x - 5 = 2 \Rightarrow x = \frac{7}{2}$

at $x = \frac{7}{2}$, $y = \frac{-1}{4}$

Equation of tangent at $\left(\frac{7}{2}, \frac{-1}{4}\right)$ is $2x - y - \frac{29}{4} = 0$

Now check options

$x = \frac{1}{8}$, $y = -7$

10. Let S be the set of all real values of λ such that a plane passing through the points $(-\lambda^2, 1, 1)$, $(1, -\lambda^2, 1)$ and $(1, 1, -\lambda^2)$ also passes through the point $(-1, -1, 1)$. Then S is equal to :

(1) $\{\sqrt{3}\}$ (2) $\{\sqrt{3} - \sqrt{3}\}$

(3) $\{1, -1\}$ (4) $\{3, -3\}$

Ans (2)

Sol. All four points are coplaner so

$$\begin{vmatrix} 1-\lambda^2 & 2 & 0 \\ 2 & -\lambda^2+1 & 0 \\ 2 & 2 & -\lambda^2-1 \end{vmatrix} = 0$$

$(\lambda^2 + 1)^2 (3 - \lambda^2) = 0$

$\lambda = \pm\sqrt{3}$

11. If a circle of radius R passes through the origin O and intersects the coordinate axes at A and B, then the locus of the foot of perpendicular from O on AB is :

(1) $(x^2 + y^2)^2 = 4Rx^2y^2$

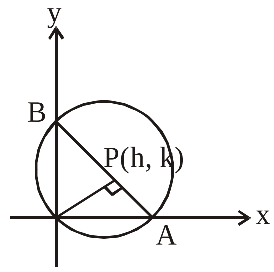
(2) $(x^2 + y^2)(x + y) = R^2xy$

(3) $(x^2 + y^2)^3 = 4R^2x^2y^2$

(4) $(x^2 + y^2)^2 = 4R^2x^2y^2$

Ans (3)

Sol.



Slope of AB $= \frac{-h}{k}$

Equation of AB is $hx + ky = h^2 + k^2$

$A\left(\frac{h^2+k^2}{h}, 0\right)$, $B\left(0, \frac{h^2+k^2}{k}\right)$

AB = 2R

$\Rightarrow (h^2 + k^2)^3 = 4R^2h^2k^2$

$\Rightarrow (x^2 + y^2)^3 = 4R^2x^2y^2$

12. The equation of a tangent to the parabola, $x^2 = 8y$, which makes an angle θ with the positive direction of x-axis, is :

(1) $x = y\cot\theta + 2\tan\theta$ (2) $x = y\cot\theta - 2\tan\theta$

(3) $y = x\tan\theta - 2\cot\theta$ (4) $y = x\tan\theta + 2\cot\theta$

Ans (1)

Sol. $x^2 = 8y$

$\Rightarrow \frac{dy}{dx} = \frac{x}{4} = \tan\theta$

$\therefore x_1 = 4\tan\theta$

$y_1 = 2\tan^2\theta$

Equation of tangent :-

$y - 2\tan^2\theta = \tan\theta(x - 4\tan\theta)$

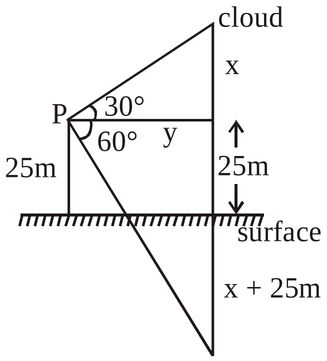
$\Rightarrow x = y\cot\theta + 2\tan\theta$

13. If the angle of elevation of a cloud from a point P which is 25 m above a lake be 30° and the angle of depression of reflection of the cloud in the lake from P be 60°, then the height of the cloud (in meters) from the surface of the lake is :

(1) 42 (2) 50 (3) 45 (4) 60

Ans (2)

Sol.



$$\tan 30° = \frac{x}{y} \Rightarrow y = \sqrt{3}\,x \qquad .....(i)$$

$$\tan 60° = \frac{25 + x + 25}{y}$$

$\Rightarrow \sqrt{3}\,y = 50 + x$

$\Rightarrow 3x = 50 + x$

$\Rightarrow x = 25$ m

$\therefore$ Height of cloud from surface = 25 + 25 = 50m

14. The integral $\int_1^e \left\{\left(\frac{x}{e}\right)^{2x} - \left(\frac{e}{x}\right)^{x}\right\}\log_e x\,dx$ is equal to :

(1) $\frac{1}{2} - e - \frac{1}{e^2}$ (2) $\frac{3}{2} - \frac{1}{e} - \frac{1}{2e^2}$

(3) $-\frac{1}{2} + \frac{1}{e} - \frac{1}{2e^2}$ (4) $\frac{3}{2} - e - \frac{1}{2e^2}$

Ans. (4)

$$\int_1^e \left(\frac{x}{e}\right)^{2x} \log_e x.dx - \int_1^e \left(\frac{e}{x}\right)\log_e x.dx$$

Let $\left(\frac{x}{e}\right)^{2x} = t$, $\left(\frac{e}{x}\right)^{x} = v$

$$= \frac{1}{2}\int_{\left(\frac{1}{e}\right)^2}^{1} dt + \int_e^1 dv$$

$$= \frac{1}{2}\left(1 - \frac{1}{e^2}\right) + (1 - e) = \frac{3}{2} - \frac{1}{2e^2} - e$$

15. $\lim_{n\to\infty}\left(\frac{n}{n^2+1^2} + \frac{n}{n^2+2^2} + \frac{n}{n^2+3^2} + ... + \frac{1}{5n}\right)$ is equal to :

(1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$

(3) $\tan^{-1}(3)$ (4) $\frac{\pi}{2}$

Ans. (2)

$$\lim_{x\to\infty}\sum_{r=1}^{2n}\frac{n}{n^2+r^2}$$

$$\lim_{x\to\infty}\sum_{r=1}^{2n}\frac{1}{n\left(1+\frac{r^2}{n^2}\right)} = \int_0^2 \frac{dx}{1+x^2} = \tan^{-1}2$$

16. The set of all values of λ for which the system of linear equations.

$x - 2y - 2z = \lambda x$

$x + 2y + z = \lambda y$

$-x - y = \lambda z$

has a non-trivial solution.

(1) contains more than two elements

(2) is a singleton

(3) is an empty set

(4) contains exactly two elements

Ans. (2)

$$\begin{vmatrix} \lambda-1 & 2 & 2 \\ 1 & 2-\lambda & 1 \\ 1 & 1 & 1 \end{vmatrix} = 0 \Rightarrow (\lambda-1)^3 = 0 \Rightarrow \lambda = 1$$

17. If ${}^nC_4$, ${}^nC_5$ and ${}^nC_6$ are in A.P., then n can be:

(1) 14 (2) 11 (3) 9 (4) 12

Ans. (1)

$2.{}^nC_5 = {}^nC_4 + {}^nC_6$

$$2.\frac{\underline{|n}}{\underline{|5}\,\underline{|n-5}} = \frac{\underline{|n}}{\underline{|4}\,\underline{|n-4}} + \frac{\underline{|n}}{\underline{|6}\,\underline{|n-6}}$$

$$\frac{2}{5}.\frac{1}{n-5} = \frac{1}{(n-4)(n-5)} + \frac{1}{30}$$

n = 14 satisfying equation.

18. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three unit vectors, out of which vectors $\vec{b}$ and $\vec{c}$ are non-parallel. If α and β are the angles which vector $\vec{a}$ makes with vectors $\vec{b}$ and $\vec{c}$ respectively and $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\frac{1}{2}\vec{b}$, then $|\alpha-\beta|$ is equal to :

(1) 60º (2) 30º (3) 90º (4) 45º

Ans. (2)

$$\left(\vec{a}.\vec{c}\right)\vec{b}-\left(\vec{a}.\vec{b}\right).\vec{c}=\frac{1}{2}\vec{b}$$

$\because$ $\vec{b}$ & $\vec{c}$ are linearly independent

$\therefore$ $\vec{a}.\vec{c}=\frac{1}{2}$ & $\vec{a}.\vec{b}=0$

(All given vectors are unit vectors)

$\therefore$ $\vec{a}\wedge\vec{c}=60^\circ$ & $\vec{a}\wedge\vec{b}=90^\circ$

$\therefore$ $|\alpha-\beta| = 30°$

19. If $A=\begin{bmatrix}1 & \sin\theta & 1\\ -\sin\theta & 1 & \sin\theta\\ -1 & -\sin\theta & 1\end{bmatrix}$; then for all $\theta\in\left(\frac{3\pi}{4},\frac{5\pi}{4}\right)$, det(A) lies in the interval :

(1) $\left[\frac{5}{2},4\right)$ (2) $\left(\frac{3}{2},3\right]$

(3) $\left(0,\frac{3}{2}\right]$ (4) $\left(1,\frac{5}{2}\right]$

Ans (2)

$$|A| = \begin{vmatrix}1 & \sin\theta & 1\\ -\sin\theta & 1 & \sin\theta\\ -1 & -\sin\theta & 1\end{vmatrix}$$

$= 2(1 + \sin^2\theta)$

$\theta \in \left(\frac{3\pi}{4},\frac{5\pi}{4}\right) \Rightarrow \frac{1}{\sqrt{2}} < \sin\theta < \frac{1}{\sqrt{2}}$

$\Rightarrow 0 \le \sin^2\theta < \frac{1}{2}$

$\therefore$ $|A| \in [2, 3)$

20. $\lim\limits_{x\to1-}\frac{\sqrt{\pi}-\sqrt{2\sin^{-1}x}}{\sqrt{1-x}}$ ie equal to :

(1) $\frac{1}{\sqrt{2\pi}}$ (2) $\sqrt{\frac{\pi}{2}}$ (3) $\sqrt{\frac{2}{\pi}}$ (4) $\sqrt{\pi}$

Ans. (3)

$$\lim_{x\to1^-}\frac{\sqrt{\pi}-\sqrt{2\sin^{-1}x}}{\sqrt{1-x}}\times\frac{\sqrt{\pi}+\sqrt{2\sin^{-1}x}}{\sqrt{\pi}+\sqrt{2\sin^{-1}x}}$$

$$\lim_{x\to1^-}\frac{2\left(\frac{\pi}{2}-\sin^{-1}x\right)}{\sqrt{1-x}\cdot\left(\sqrt{\pi}+\sqrt{2\sin^{-1}x}\right)}$$

$$\lim_{x\to1^-}\frac{2\cos^{-1}x}{\sqrt{1-x}}\cdot\frac{1}{2\sqrt{\pi}}$$

Put x = cosθ

$$\lim_{\theta\to0^+}\frac{2\theta}{\sqrt{2}\sin\left(\frac{\theta}{2}\right)}\cdot\frac{1}{2\sqrt{\pi}}=\sqrt{\frac{2}{\pi}}$$

21. The expression ~(~p→q) is logically equvalent to :

(1) ~ p ^ ~ q (2) p ^ q

(3) ~ p ^ q (4) p ^ ~ q

Ans. (1)

p	q	~p	~p→q	~(~p→q)	(~p ^ ~q)
T	T	F	T	F	F
F	T	T	T	F	F
T	F	F	T	F	F
F	F	T	F	T	T

22. The total number of irrational terms in the binomial expansion of $\left(7^{1/5}-3^{1/10}\right)^{60}$ is :

(1) 55 (2) 49 (3) 48 (4) 54

Ans. (4)

General term $T_{r+1} = {}^{60}C_r\ 7^{\frac{60-r}{5}}\ 3^{\frac{r}{10}}$

$\therefore$ for rational term, r = 0, 10, 20, 30, 40, 50, 60

$\Rightarrow$ no of rational terms = 7

$\therefore$ number of irrational terms = 54

23. The mean and the variance of five observation are 4 and 5.20, respectively. If three of the observations are 3, 4 and 4; then then absolute value of the difference of the other two observations, is :

(1) 1 (2) 3 (3) 7 (4) 5

Ans. (3)

mean $\overline{x} = 4, \sigma^2 = 5.2, n = 5,. x_1 = 3\ x_2 = 4 = x_3$

$\sum x_i = 20$

$x_4 + x_5 = 9$ ....(i)

$$\frac{\sum x_i^2}{x} - (\overline{x})^2 = \sigma^2 \Rightarrow \sum x_i^2 = 106$$

$x_4^2 + x_5^2 = 65$ ....(ii)

Using (i) and (ii) $(x_4 - x_5)^2 = 49$

$|x_4 - x_5| = 7$

24. If the sum of the first 15 tems of the series $\left(\frac{3}{4}\right)^3 + \left(1\frac{1}{2}\right)^3 + \left(2\frac{1}{4}\right)^3 + 3^3 + \left(3\frac{3}{4}\right)^3 + ...$ is equal to 225 k, then k is equal to :

(1) 9 (2) 27 (3) 108 (4) 54

Ans. (2)

$$S = \left(\frac{3}{4}\right)^3 + \left(\frac{6}{4}\right)^3 + \left(\frac{9}{4}\right)^3 + \left(\frac{12}{4}\right)^3 + ...15\text{ term}$$

$$= \frac{27}{64}\sum_{r=1}^{15} r^3$$

$$= \frac{27}{64} \cdot \left[\frac{15(15+1)}{2}\right]^2$$

= 225 K (Given in question)

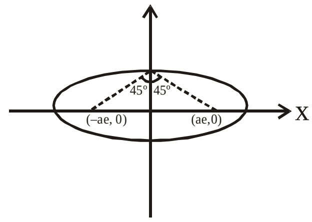
K = 27

25. Let S and S' be the foci of the ellipse and B be any one of the extremities of its minor axis. If ΔS'BS is a right angled triangle with right angle at B and area (ΔS'BS) = 8 sq. units, then the length of a latus rectum of the ellipse is :

(1) $2\sqrt{2}$ (2) 2 (3) 4 (4) $4\sqrt{2}$

Ans. (3)

$m_{SB} \cdot m_{S'B} = -1$



$b^2 = a^2e^2$ .... (i)

$\frac{1}{2}S'B \cdot SB = 8$

S'B. SB = 16

$a^2e^2 + b^2 = 16$ ..... (ii)

$b^2 = a^2\ (1 - e^2)$ ..... (iii)

using (i),(ii), (iii) a = 4

$b = 2\sqrt{2}$

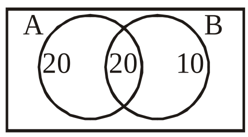
$e = \frac{1}{\sqrt{2}}$

$\therefore \ell$ (L.R) $= \frac{2b^2}{a} = 4$ $\boxed{\text{Ans.3}}$

26. In a class of 60 students, 40 opted for NCC, 30 opted for NSS and 20 opted for both NCC and NSS. If one of these students is selected at random, then the probability that the student selected has opted neither for NCC nor for NSS is :

(1) $\frac{2}{3}$ (2) $\frac{1}{6}$ (3) $\frac{1}{3}$ (4) $\frac{5}{6}$

Ans. (2)



A $\rightarrow$ opted NCC

B $\rightarrow$ opted NSS

$\therefore$ P (nither A nor B) = $\frac{10}{60} = z\frac{1}{6}$

27. The number of integral values of m for which the quadratic expression.

$(1 + 2m)x^2 - 2(1 + 3m)x + 4(1 + m)$, $x \in R$, is always positive, is :

(1) 8 (2) 7 (3) 6 (4) 3

Ans. (2)

Exprsssion is always positve it

$2m + 1 > 0 \Rightarrow m > -\frac{1}{2}$

&

$D < 0 \Rightarrow m^2 - 6m - 3 < 0$

$3-\sqrt{12} < m < 3+\sqrt{12}$ .... (iii)

$\therefore$ Common interval is

$3-\sqrt{12} < m < 3+\sqrt{12}$

$\therefore$ Intgral value of m {0,1,2,3,4,5,6}

28. In a game, a man wins Rs. 100 if he gets 5 of 6 on a throw of a fair die and loses Rs. 50 for getting any other number on the die. If he decides to throw the die either till he gets a five or a six or to a maximum of three throws, then his expected gain/loss (in rupees) is :

(1) $\frac{400}{3}$gain (2) $\frac{400}{3}$loss

(3) 0 (4) $\frac{400}{9}$loss

Ans. (3)

Expected Gain/ Loss =

= w × 100 + Lw (–50 + 100) + L^2w (–50 –50 + 100) + L^3 (–150)

$= \frac{1}{3}\times 100+\frac{2}{3}.\frac{1}{3}(50) + \left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)(0) + \left(\frac{2}{3}\right)^3(-150) = 0$

here w denotes probability that outcome 5 or 6 ($w = \frac{2}{6} = \frac{1}{3}$)

here L denotes probability that outcome 1,2,3,4 ($L = \frac{4}{6} = \frac{2}{3}$)

29. If a cuver passes through the point (1, –2) and has slope of the tangent at any point (x, y) on it as $\frac{x^2-2y}{x}$, then the curve also passes through the point :

(1) $\left(-\sqrt{2},1\right)$ (2) $\left(\sqrt{3},0\right)$

(3) (–1, 2) (4) (3, 0)

Ans. (2)

$\frac{dy}{dx} = \frac{x^2-2y}{x}$ (Given)

$\frac{dy}{dx} + 2\frac{y}{x} = x$

I.F = $e^{\int \frac{2}{x}dx} = x^2$

$\therefore$ $y.x^2 = \int x.x^2dx + C$

$= \frac{x^4}{y} + C$

hence bpasses through (1, –2) $\Rightarrow C = -\frac{9}{4}$

$\therefore$ $yx^2 = \frac{x^4}{4} - \frac{9}{4}$

Now check option(s) , Which is satisly by option (ii)

30. Let Z_1 and Z_2 be two complex numbers satisfying $|Z_1| = 9$ and $|Z_2–3–4i|=4$. Then the minimum value of $|Z_1–Z_2|$ is :

(1) 0 (2) 1 (3) $\sqrt{2}$ (4) 2

Ans. (1)

$|z_1| = 9$, $|z_2 - (3+4i)| = 4$

C_1 (0, 0) radius $r_1 = 9$

C_2(3, 4), radius $r_2 = 4$

$C_1C_2 = |r_1–r_2| = 5$

$\therefore$ Circle touches internally

$\therefore$ $|z_1 - z_2|_{min} = 0$